

I. Claims 1-11 Should Be Properly Rejoined

Applicants hereby affirm the provisional election of Group I, claim 1, drawn to a sandwich structure, with traverse. The provisional election was made by telephone on June 17, 2002 in response to the June 13, telephone Restriction Requirement.

Applicants respectfully submit that the subject matter of all claims 1-11 is sufficiently related that a thorough search for the subject matter of any one Group of claims would encompass a search for the subject matter of the remaining claims. Thus, Applicants respectfully submit that the search and examination of the entire application could be made without serious burden. See MPEP §803 which states that “if the search and examination of the entire application can be made without serious burden, the Examiner must examine it on the merits even though it includes claims to distinct or independent inventions” (emphasis added).

Applicants respectfully submit that this policy should apply in the present application in order to avoid unnecessary delay and expense to Applicants and duplicative examination by the Patent Office. Thus, withdrawal of the Restriction Requirement and rejoinder of claims 2-11 with claim 1 are respectfully requested.

II. Claim 1 Defines Patentable Subject Matter

The Office Action rejects claim 1 under 35 U.S.C. §103(a) over U.S. Patent 5,916,469 to Scoles et al. (Scoles) either individually or in view of U.S. Patent 5,481,091 to Grimm et al. (Grimm). This rejection is respectfully traversed.

Neither Scoles nor Grimm teaches or suggests a sandwich structure including a core having foam plastic core members formed of a closed-cell foam plastic material, wherein the closed-cell foam plastic material having a plastic material and foams within the plastic material, each of the foams within the plastic material being distributed independently each other from other foam, and surface plates formed of a fiber-reinforced composite material covering the opposite surfaces of the core, the fiber-reinforcing composite material having a

component resin and hydrophobic inorganic fibers as reinforcing fibers contained within the component resin, wherein the foam plastic core members are bonded together with adhesive films that do not foam, and the surface plates are bonded to the core with adhesive films not containing any carrier or the composite resin of the fiber-reinforced composite material forming the surface plates, as recited in claim 1. Grimm

Instead, Scoles discloses a sandwich structure having a foam core 1550 used for holding Z-pins 1545 during thermoplastic welding, rather than for serving as a structural member. See col. 24, line 58 - col. 25, line 15 and Fig. 21 of Scoles. Also, Scoles discloses a bond padup strip 820 penetrated by Z-pin stubble 712 layered between a wing skin 100 and a spar 200. See col. 21, lines 28-38 and Fig. 12 of Scoles.

In Scoles, a release film 600 caps a detail part 500 and a perform 650 provides Z-pins 130, after which the release film 600 and perform 650 are removed, leaving a stubble interface 712 on the part 500. See col. 22, line 61 - col. 23, line 7 and Fig. 16 of Scoles. For thermoplastic welding, Scoles teaches positioning a thermoplastic film 2415 on a prefabricated fiber-reinforced part 2410, placing the susceptor 2405 on the film 2415 and applying heat and pressure to the assembly. See Abstract, col. 26, lines 50-54 and Fig. 24 of Scoles. By providing for a stubble interface perpendicular to the layer surfaces to be bonded, Scoles teaches concepts unrelated to the closed-cell foam plastic material having a plastic material and foams within the plastic material, each of the foams within the plastic material being distributed independently each other from other foam featured in Applicants' claims. /

Further, Grimm does not compensate for the deficiencies of Scoles outlined above for claim 1. Instead, Grimm discloses welding of thermoplastic material, without relation to a sandwich structure or its repair. In particular, Grimm teaches providing a current conducting strip 12 in the bondline between surfaces 14 and 16 of substrates 28 and 30. An electromagnetic field 108 induces current through the strip 12 to weld the substrates 28 and

30 together. See col. 8, lines 19-29 and Fig. 1 of Grimm. Additionally, Grimm discloses, for a curved bondline, providing a braid tube 50 having a conducting fiber weave 52 between the substrates 28 and 30. An electromagnetic field 108 induces current through the braid tube 50 fusing together the substrates 28 and 30. See col. 10, line 62 - col. 11, line 36 and Figs. 7-9 of Grimm. By providing an electric conductor to the layer surfaces to be bonded, Grimm teaches concepts unrelated to the closed-cell foam plastic material having a plastic material and foams within the plastic material, each of the foams within the plastic material being distributed independently each other from other foam featured in Applicants' claims.

As recited in claim 1 and described in the specification at page 3, lines 24-35, because the sandwich structure is provided with the foam plastic core members of a closed-cell foam plastic material, water is unable to collect in the sandwich structure. Because the foam plastic core members are bonded together with an adhesive film that does not foam and the composite surface plates are bonded to the core with an adhesive film not having any carrier or component resin of the fiber-reinforced composite material forming the composite surface plates, any passages through which water penetrates and diffuses into the sandwich structure are not formed at all.

Consequently, the sandwich structure, as recited in Applicants' claims, avoids damage from water penetration into the sandwich structure. Further, the surface plates are formed from a fiber-reinforced composite material having a component resin and hydrophobic inorganic fibers as reinforcing fibers contained within the component resin. Because the fiber-reinforced composite material prevents water penetration, Applicants' surface plates avoid any passages through which water can penetrate and diffuse into the sandwich structure. Neither Scoles nor Grimm teaches or suggests such claimed features.

Further, there is no motivation to combine features related to depositing stubble by a preform layer of Scoles with providing an electrical conductor between substrates of Grimm,

not
claimed

nor has the Office Action established sufficient motivation or a *prima facie* case of obviousness.

For at least these reasons, Applicants respectfully assert that claim 1 is now patentable over the applied references, and consequently is in condition for allowance. Thus, Applicants respectfully request that the rejection under 35 U.S.C. §103 be withdrawn.

III. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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Attachments:

Petition for Extension of Time
Appendix

Date: December 19, 2002

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<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>
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APPENDIX

Changes to Specification:

The following is a marked-up version of the amended paragraphs.

Page 12, lines 10-22:

Referring to Fig. 3 showing a sandwich structure 70 in a third embodiment according to the present invention, the sandwich structure 70 has a core 77 including foam plastic core members 72 and 73 of a closed-cell foam plastic material and a honeycomb core member 71 sandwiched between the foam plastic core members 72 and 73, and surface plates 75 and 76 bonded to the opposite surfaces of the core 77, respectively. The foam plastic core members 72 and 73 are bonded to the honeycomb core member 71 with adhesive films 78 not containing any carrier. The surface plates 75 and 76 are bonded to the core 77 with adhesive films 79 not containing any carrier. The surface plates 75 and ~~75~~ 76 are formed of a fiber-reinforced composite material containing hydrophobic inorganic fibers.

Page 12, lines 23-29:

~~Since~~ Because the honeycomb core member 71 is sandwiched between the foam plastic core members 72 and 73, water is unable to leak into the sandwich structure even if the surface plate 75 or 76 is fissured. ~~Since~~ Because the foam plastic members 72 and 73 capable of absorbing shocks are contiguous with the surface plates ~~75~~ 75 and 76, the sandwich structure 70 is resistant to damaging actions.

Page 15, lines 19-28:

Referring to Fig. 11, the rivets 25 are blind rivets that can be staked from one side thereof. Each rivet 25 has a countersunk flat head 26 that can be set flush with the outer surface of the outer surface plate 2. The rivet ~~27~~ 25 has a hollow rod 27 and a draw bar 28 inserted in the hollow rod 27. A sleeve 30 is put on an inner end portion of the draw bar 28 projecting from the hollow rod 27, and the inner end of the draw bar 28 is connected to a

solid bolt 31 formed at the extremity of the sleeve 30. A coiled washer 32 is disposed on the base end of the sleeve 30. An inner end portion of the hollow rod 27 is tapered.

Page 16, lines 22-35:

After the cover plate 40 has been thus fastened to the support plate 16 with the rivet 25, two through holes 41 and 42 are formed through the cover plate 40 and the support plate 16. A filling material 43 is injected through the through hole 41 into the space formed in the sandwich structure 1 by means of an injection gun. The filling material 43 is a liquid foaming resin containing minute bubbles. The space formed by removing the portions of the core 4 is filled up with the filling material 43 as shown in Fig. 13. After the space has been fully filled with the filling material 43, the filling material 43 overflows through the other through hole 42, which indicates that the space has been fully filled with the filling material 43. The filling material 43 injected into the space sets perfectly in a predetermined time. The filling material 43 sets at an ordinary temperature.

Changes to Claims:

The following is a marked-up version of the amended claim:

1. (Amended) A sandwich structure comprising:

a core having foam plastic core members formed of a closed-cell foam plastic material, wherein the closed-cell foam plastic material having a plastic material and foams within the plastic material, each of the foams within the plastic material being distributed independently each other from other foam; and

surface plates formed of a fiber-reinforced composite material ~~containing~~ covering the opposite surfaces of the core, said fiber-reinforcing composite material having a component resin and hydrophobic inorganic fibers as reinforcing fibers and covering the opposite surfaces of the core contained within the component resin;

wherein the foam plastic core members are bonded together with adhesive films that do not foam, and the surface plates are bonded to the core with adhesive films not containing any carrier or a the composite resin of the fiber-reinforced composite material forming the surface plates.